

REMARKS

I. Status of the Claims

Claims 25, 26 and 33-47 are pending in this application. No claim is presently amended, and no claim has been allowed.

II. Rejection Under 35 U.S.C. § 103

The Examiner has maintained the rejection of claims 25, 26 and 33-47 under 35 U.S.C. §103 as being unpatentable over Japanese reference 1-110123 for the reasons of record. Specifically, the Examiner continues to assert that the Japanese reference teaches a foaming agent that may be as thick as 0.3mm, and foaming it "almost eight times" to achieve a thickness of almost 2.4mm or a maximum embossment of almost 2.1mm (relative to the initial thickness of 0.3mm). Applicants continue to traverse this rejection for the reasons of record as well as the following reasons.

Applicants believe that the Japanese reference fails to teach or suggest the limitation: "a chemically embossed portion of the first layer has a depth greater than any embossed portion of the second layer." The limitation requires a comparison in cross-section of the deepest chemical emboss depth with the mechanical emboss depths. The mechanical emboss depth is the depth of embossment due to mechanical embossing techniques and the chemical emboss depth is the depth of embossment due to chemical embossing techniques. An emboss depth is the difference between the unembossed surface and the deepest part of the embossed surface. The deepest

part of an embossed surface is the deepest point where the slope of a line tangent to that surface is zero. It is entirely possible, though not preferred under the present invention, for mechanical embossments to be found in the chemically embossed portions, provided that a chemically embossed portion of the first layer has a depth greater than any embossed portion of the second layer.

Here, the Japanese reference does not provide information regarding the change in thickness due to the mechanical embossment; however, for sake of argument, we have assumed that the mechanical emboss depth is no greater than the height of the pattern on the emboss roller.

The Examiner's rejection is based on the mistaken assumption that the maximum chemical embossment of 2.1mm is merely the difference between the initial foaming agent thickness (0.3mm) and the maximum foamed thickness (2.4mm). However, the critical flaw in this calculation is that it assumes that the retarder composition is 100% effective, i.e., that the initial recessed thickness remains at 0.3mm. As shown below, retarder compositions have never approached 100% effectiveness, especially at maximum expansion. Consequently, the chemically embossed depth should be much less than 2.1mm and not meet the claimed invention.

For example, the seminal patent for retarder compositions, U.S. Patent No. 3,293,108 to Nairn et al., (copy attached) exemplifies retarder compositions that are 5 to 50% effective. See, e.g., the Table at col. 30, specifically the column entitled "Depth

of Depression (Percent of Total Thickness)." Assuming that the retarder composition in Japanese '123 is 50% effective, as taught in Nairn, the maximum embossment would be 1.2mm and not 2.1mm (i.e., 2.4mm - 1.2mm (0.3mm x 4 - or foaming to 50% of "almost 8 times"))).

Even assuming that the retarder composition of Japanese '123 is 75% effective, or 50% more than the maximum value exemplified in Nairn, the maximum embossment would only be 1.8mm and not 2.1mm (i.e., 2.4mm - 0.6mm (0.3mm x 2 - or foaming to 25% of "almost 8 times"))).

Applicants submit that an effectiveness of 50%, as taught by Nairn, would also be true for the inhibitors described in the Japanese reference since this reference teaches the same inhibitors described in Nairn. Specifically, the sentence bridging pages 5-6 of Japanese '123 teaches the foaming inhibitor can comprise the same organic acid, halogenated organic acid or organic acid anhydride inhibitors taught in Nairn. See, Nairn at col. 14, line 47 to col. 15, line 37.

One of ordinary skill in the art would reasonably conclude that a mechanical embossing roll having a depth of unevenness up to 2.0mm more often than not leads to a mechanical embossing depth greater than the chemical emboss depth, considering the effectiveness of the inhibitor would lead to foam layer that has a protruding thickness of much less than 2.0mm.

The Examiner's attention is next directed to the attached copy of U.S. Patent No. 5,441,563 to Sideman et al., which teaches inhibitors used in chemical embossing of surface coverings. Sideman, like Nairn, supports Applicants' position that inhibitors used to chemically emboss surface coverings are not 100% effective, but approach an effectiveness of 50%. Sideman, which issued August 15, 1995, describes the inhibitors disclosed in the Nairn patent as being among the most commonly used industrially, thirty years after being described in Nairn. See, col. 1, lines 31-36. It is clear that inhibitors and their effectiveness have not changed much, if at all, from those described in Nairn. In fact, Sideman teaches new inhibitors having an effectiveness of about 40%, which is similar to the values taught in Nairn. See, examples 14-19 at col. 11.

This reference specifically teaches expanding a 9 mil layer to about 25 mils. The chemical embossing depth (which is the difference between the thickness of the recessed areas coated with an inhibitor and the unprinted expanded surrounding areas) is taught at most as 10.8 mils. See Table I in col. 11. Sideman shows that the area under the inhibitor expands at least 5.2 mils. See, e.g., Example 19, which teaches 25mils (maximum embossment) - 10.8 (chemical emboss) = 14.2. Since the original layer was 9 mils, the layer under the inhibitor expanded $14.2 - 9 = 5.2$ mils. In other words, the area under the retarder composition expanded to 58% of its original thickness, i.e., Sideman shows that the effectiveness of his inhibitors are at most, 42%, and as low as 6% effective for example 16.

The effectiveness of retarder compositions taught in the references provided above is supported by the enclosed photographs showing that there is necessarily foaming under the retardation area of a chemically embossed area. The Examiner's attention is directed to the attached Polaroid photograph, which illustrates the foaming that occurs under a traditional vinyl surface covering. The larger color photograph is an expanded representation of the smaller Polaroid photograph meant to show the inevitable foaming that occurs under a retarder composition.

Furthermore, it is well-known to one skilled in the art that embossing depth is dependent upon numerous factors that include the types and concentrations of the inhibitors and blowing agents used, the fusion conditions, such as temperature and time of foaming, and thickness of the foaming layer and wear layer. It would thus be intuitive that modification of these factors to achieve the maximum foaming (described in Japanese '123 as "almost 8 times" the original thickness) would also necessarily result in the maximum foaming under the retardation area of a chemically embossed area. This position is supported by the article by Andrew Hunter, "Inhibition of Chemically Foamed PVC Plastisols - A Brief Study," *Cellular Polymers*, Vol. 2 (1983), copy enclosed herewith ("the Hunter reference").

Applicants discuss and incorporate by reference the teachings of this article in the present specification at page 18, lines 11-12. The Hunter reference compares the thickness under an inhibiting ink with the unprinted expanded surrounding areas. See,

the Results section starting on page 244, specifically Table 3(a). Significantly, the results show that when a 0.25mm coating is expanded up to about three and one-half times its original thickness (from 0.25mm to 0.89mm), the foam under the inhibiting ink expands about 20% (from 0.25mm to 0.3mm). Thus, the inhibiting ink is about 80% effective up to an expansion factor of about 3.5. If we assume the retarder composition taught in the Japanese reference was 80% effective, it would only result in a maximum chemical embossment of 1.92mm, and thus the present claims still would not read on the Japanese reference. Furthermore, when one tries to expand the foam to less than six times its original thickness (from 0.25mm to 1.37mm), the foam under the inhibitor expands almost 70% (from 0.25mm to 0.61mm). In other words, the retarder ink is about 30% effective at this higher expansion factor.

Based on the trend in the Hunter reference, which shows lower effectiveness at higher expansion factors, one can reasonably assume that the inhibitors in the Japanese reference are less than 30% effective. For example, Figure 1 shows "Ideal Inhibition," which is defined as being no expansion under the inhibiting ink. See, the Discussion section starting on page 246. The author describes the contrast (which is the difference between the thickness of the foam under the inhibitor and the expanded foam thickness) as diverging from the ideal inhibition at higher EF's (expansion factors). See, the first sentence on page 247. Accordingly, upon expanding the foam layer by almost eight times its initial thickness, the above difference between chemical and

mechanical embossment ratios would be more pronounced in a manner contrary to the claimed invention.

Interestingly, the author describes this affect as having little consequence in floor covering because it is well-known that mechanical properties would be "detrimentally affected at EF's of a high magnitude." See, the first paragraph on page 247. Rather, this reference teaches that EF's of a high magnitude are important in certain wall coverings. See *Id.*

Assuming the inhibitor is 30% effective, which is more than reasonable for foam expansion of 8 times, the result is not a surface covering in which a chemically embossed portion of the first layer has a depth greater than any embossed portion of the second layer. That is, if the maximum protrusion on the roller embosser is 2.0mm (as taught in the Japanese reference), portions of the mechanical embossing area would be deeper than the chemical embossed areas, even if the mechanical embossing is not 100% effective, and thus would not lead to a mechanical embossed depth of 2.0mm. For example, if mechanical embossing is 50% effective and results in an embossed depth of 1.0mm, the surface covering would still not meet the claimed invention in which a chemically embossed portion of the first layer has a depth greater than any embossed portion of the second layer. That is, the chemically embossed depth would be 0.72 mm $[2.4\text{mm} - 1.68\text{mm} (0.3\text{mm} \times 5.6 - \text{or foaming to } 70\% \text{ of}$

"almost 8 times") = 0.72mm], while the mechanically embossed depth would be 1.0mm (50% of 2.0mm).

Applicants again submit that the results described in the Hunter reference would be the same for the inhibitors described in Japanese '123, since the Hunter reference teaches the same inhibitors described in Japanese '123, including the prior art's preferred inhibitors, i.e., benzotriazole and trimetallic anhydride (TMA). See, the Hunter reference at Tables 2, 3(a) and (b), and Fig. 1. Example 2 of the Japanese reference, the only teaching on retarder effectiveness in Japanese '123, supports this position. That is, this example teaches a 0.18mm thick layer that is foamed four times its thickness to form 0.9mm protruding surfaces. This example also teaches that the area under the retarder composition expands from its original thickness of 0.18mm to form recessed surfaces that are 0.4mm thick. See, page 10. For the reasons outlined in Hunter, one would objectively conclude that the effectiveness of the retarder composition would be even lower if the expansion factor was increased from four to eight, the modification required if the Examiner's assertions are realized.

The teachings in the Hunter reference rebut the Examiner's assertion of obviousness over Japanese '123 for a couple of reasons. First, like Nairn and Sideman, this reference shows that it is well-known that inhibitors, including those preferred in Japanese '123, are less than 50% effective when used to achieve the properties asserted as obvious by the Examiner. Accordingly, the foam layer under the

inhibiting layer necessarily expands such that the covering described in the Japanese reference does not meet the claimed chemical to mechanical embossing ratios.

This reference also teaches that it is very-well known in the art of floor coverings that a foam layer is not expanded to a maximum extent, e.g., 5.4 times the original thickness in the Hunter reference. As shown in the Hunter reference, the low density and poor mechanical properties associated with expanding a foam layer to almost eight times its original thickness, as asserted as obvious by the Examiner in view of Japanese '123, would preclude one of ordinary skill in the art from modifying the teachings in the Japanese reference to obtain the claimed invention. Rather, Hunter supports Applicants position that Japanese '123 is directed to internal decorative material for walls. See, e.g., the paragraph bridging pages 4-5 of Japanese '123. Assuming, for the sake of argument only, that it would have been obvious to foam the material in the Japanese reference to almost eight times its original thickness, it still would not have produced the claimed invention. As shown above, foaming under the inhibitor ink is inevitable and leads to a product that is neither similar to, nor an obvious variant of the claimed surface covering.

Notwithstanding the foregoing, the Japanese reference simply does not teach or suggest a method of making a surface covering comprising both chemically and mechanically embossed portions in which the chemically embossed portion has a depth greater than any mechanically embossed portion. Rather, when this reference does

describe the relative embossing depths, it is in the opposite configuration as that claimed. Contrary to the Examiner's assertions, Applicants are not asserting that relevant teachings of Japanese '123 are limited to what is disclosed in the examples. Indeed, as detailed above, Applicants have primarily focused on the general teachings of this reference when it describes the inhibitors and the maximum embossment. Applicants have attempted to show that it would have been readily apparent to one skilled in the art that well-known inhibitor properties, coupled with the general teachings of the prior art, would not lead one to the claimed invention. However, beyond these general teachings, which do not suggest the claimed invention, the Japanese reference specifically exemplifies decorative products having emboss depths in opposite configurations to the claimed depths. Applicants are relying on the specific teachings and examples in the Japanese reference to support their position that this reference does not suggest, and thus does not render obvious the claimed invention. Applicants maintain their position that teaching embossing depth in the opposite configuration to the claimed invention, absent any other teaching in the reference to the contrary, is very strong evidence of non-obviousness.


For the reasons detailed above, the Japanese reference does not teach or suggest the claimed invention nor does it provide an adequate basis for a reasonable expectation of success by exemplifying and illustrating relative depths outside the claimed limitations.

III. Conclusion

In view of the foregoing remarks, Applicants respectfully request reconsideration of the application and timely allowance of the pending claims. Please grant any necessary extensions of time required to enter this response and charge any additional required fees to our deposit account no. 06-0916.

Respectfully submitted,

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